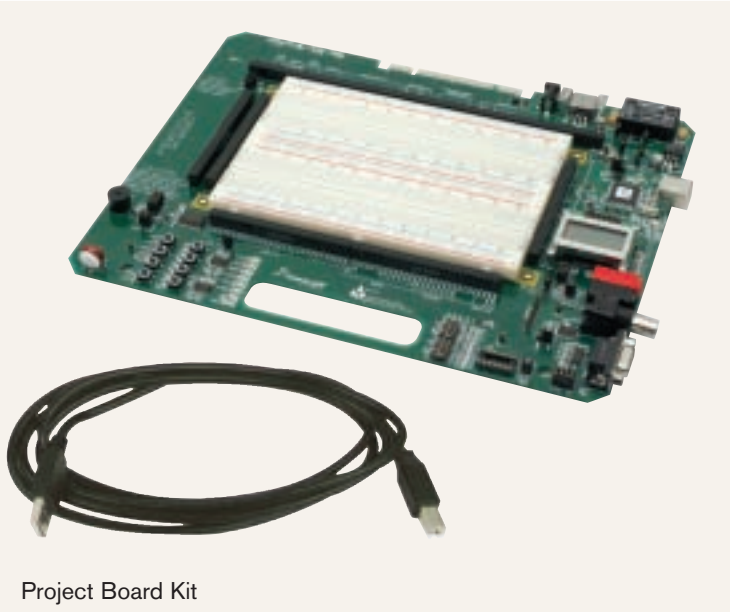


# Freescalé's Microcontroller Student Learning Kit

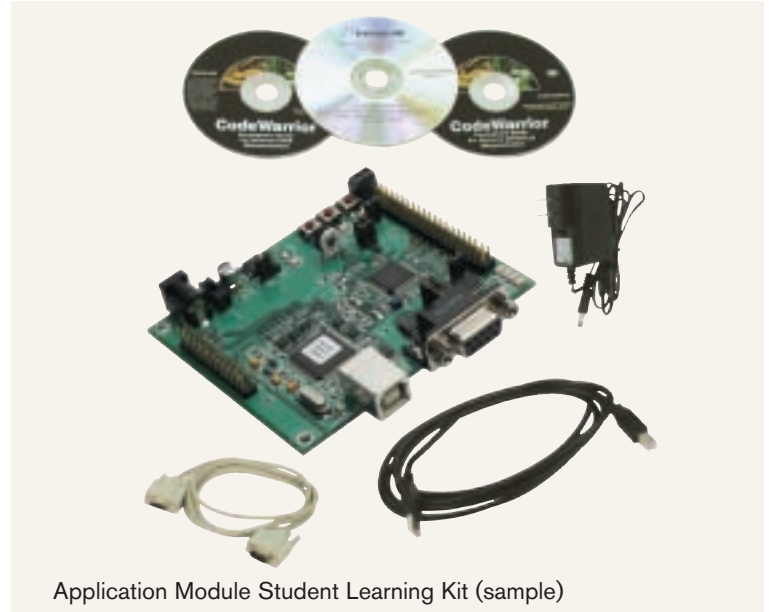
## Overview

Freescalé's Microcontroller Student Learning Kits (MCUSLK) now give you the flexibility to choose!

The MCUSLKs now come with a feature-rich project board and your choice of an Application Module Student Learning Kit (APSLK). Best of all, the application modules are specifically designed to plug directly into the project board.



Project Board Kit



Application Module Student Learning Kit (sample)

The Project Board Kit can be used standalone for introductory circuit design or used in conjunction with the application modules. The Project Board Kit allows you to easily migrate from one application module to another, providing great flexibility in using a range of 8-, 16- and 32-bit microcontrollers.

### Features:

- > Integrated HCS12/HCS12X/HCS08 USB BDM pod
  - > USB or wall transformer powered (+3.3, +5 or  $\pm 15V^*$ )
  - > Replaceable, solderless breadboard
  - > Eight LED's, push buttons, DIP switches
  - > 2-line, 8-character LCD display
  - > Integrated buzzer and potentiometer
  - > DB-9 connector (RS-232/MON08 capable)
  - > Optional direct connect feature
- \*15V not available when powered from USB BDM

The APSLK can also be used standalone for small projects or plugged into the project board. The APSLK contains an application module (microcontroller board), CodeWarrior™ programming development tools, as well as documentation, power and communications cables to provide you with a complete learning environment.

### Application Modules:

- > **8-bit HCS08**
  - APS08QG8SLK
- > **16-bit HCS12/DSP**
  - APS12DT256SLK
  - APS12C32SLK
  - APS12XDT512SLK
  - AP56F801SLK

### > 32-bit ColdFire™

- AP5211SLK
- AP52233SLK (on-chip Ethernet)

### > ZigBee™-ready RF transceiver\*\*

- AP13192USLK

\*\*Freescalé's newest SLK keeps you up to date with the latest innovations. Now, wireless development is simple by providing two ZigBee-ready RF transceivers, SMAC software and a flexible development suite.

# Application Modules

Application Modules can be used as stand-alone platforms or interfaced through the on-board MCU connector on the project board or other compatible expansion platforms. This range of applications modules provides flexibility in the modules' use, ranging from introductory embedded systems to more advanced courses. Also, due to the small size, the modules are outstanding tools for incorporating into senior- or graduate-level projects, such as robotics or controls.

**68K/ColdFire**  
AP5223SLK



**68K/ColdFire**  
AP5211SLK



**DSP**  
AP56F801SLK



**HCS08**  
APS08QG8SLK



## Project Board

Part Number	Voltage Input (V)	USB Power Limit	VIN Power Limit	Communications I/O
PBMCUSK	USBBDM or 9	5V (300 mA), 3.3V (200 mA)	5V and 3.3V (500 mA) + 15V (50 mA)	RS232 or Mono8

## Application Modules

Architecture	Part Number	RAM (KB)	Flash (KB)	EEPROM (KB)	Timers (ch./bits)	I/O Max	PWM (ch./bits)
HCS08	APS08QG8SLK	0.512	8	–	2/16	11	see timer
HCS12	APS12C32SLK	2	32	–	8/16	31	3/16 or 5/8
HCS12	APS12DT256SLK	12	256	4	8/16	56	4/16 or 7/8
HCS12X	APS12XDT512SLK	20	512	4	8/16	56	4/16 or 7/8
DSP	AP56F801SLK	4	24	–	8/16	11	6/16
ColdFire	AP5211SLK	16	128	–	4-ch., 32-bit w/DMA, 4-ch., 16-bit	33	4/16 or 8/8
ColdFire	AP5223SLK	32	256	–	4-ch., 32-bit w/DMA, 4-ch., 16-bit	35	4/16 or 8/8
RF-Transceiver	AP13192USLK	Voltage: 2.0–3.4V, Frequency Band: 2.4–2.5 GHz, Data Rate: 250 kbps, Serial I/O:SPI-,					



## ZigBee™-Ready Module

### AP13192U

The AP13192U module is a 2.4 GHz wireless transceiver for applications in the short-range, low-power, industrial, scientific and medical band. When combined with a host applications module or microcontroller, the AP13192U provides a cost-effective solution for short range wireless data links and networks. The module is capable of providing basic point-to-point wireless connection up to the IEEE 802.15.4 wireless standard modem physical layer (PHY) with support for peer-to-peer, star and mesh networks. Interface to the hosting application module is by serial peripheral (SPI) port connection.



## HCS12

### APS12C32SLK



## HCS12

### APS12DT256SLK



## HCS12X

### APS12XDT512SLK

Keypad Port	LCD Display	User I/O	Features
Yes	8 Characters X 2 Lines	8 x DIP switches, 8 x Pushbuttons, 8 x LEDs, Potentiometer, Buzzer, BNC, 2 x Banana	Optional Direct Connect Features, Replaceable Protoboard, USBBDM for Use with HCS12/12X/08

ATD (ch./bits)	Voltage (V)	Bus Freq. (MHz)	Serial	Other	Features
8/10	1.8 to 3.6	10	SPI, SCI, I <sup>2</sup> C	–	
8/10	5	25	SCI, SPI, CAN	–	On-Chip ICE
8/10	5	25	2xSCI, 2xSPI, I <sup>2</sup> C, 3 x CAN	9 x KBI	Increased I/O and Memory
8/10	5	40	2xSCI, 2xSPI, I <sup>2</sup> C, 3 x CAN	9 x KBI	XGATE, LIN, On-Chip ICE, IR
8/12	3.3	80	SCI, SPI	–	Multiply Accumulator, JTAG/OnCE
8/12	3.3	66	QSPI, I <sup>2</sup> C, 3 x UART	3 x IRQ	2 x 16-bit PIT
8/12	3.3	60	QSPI, I <sup>2</sup> C, 3 x UART,	3 x IRQ	On-Chip 10/100 Ethernet MAC with PHY, Real-Time Clock

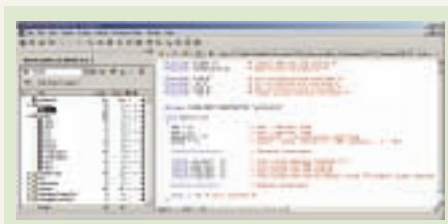
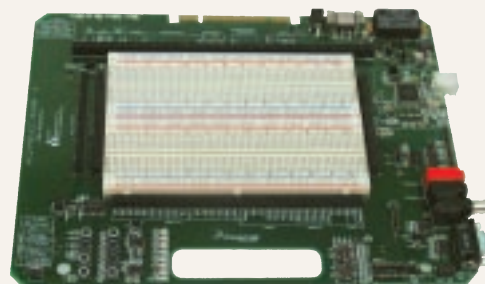
# A Prototyping Environment for Education

Microcontroller Student Learning Kit PLUS CodeWarrior™ Development Tools and National Instruments' Educational Laboratory Virtual Instrumentation Suite (NI ELVIS)

The Project Board Student Learning Kits are excellent teaching solutions and can be used in a diverse mix of coursework, such as:

- > Electronic Circuit Design I and II
- > Introduction to Microcontrollers
- > Microcontroller Interfacing and Applications
- > Mixed Signals and Circuits
- > Real-Time Digital Signal Processing
- > Real-Time Embedded Microcontrollers
- > Senior Project Design
- > Mechatronics

Your students can benefit as well from the reasonable price point and versatility of Microcontroller Student Learning Kits and are encouraged to purchase their own kit to use throughout their studies.



**CodeWarrior Development Studio** is a powerful and user-friendly tool suite designed to increase your software development productivity. It shares a common interface across MCU families, making the environment easy to use. With unrivaled features such as the Processor Expert™ application design tool, a highly optimized compiler and the project manager with built-in templates, the tool suite's integrated development environment (IDE) allows the student to focus on the application software. The CodeWarrior environment also features an intuitive graphical source-level debugger with integrated profiling capabilities, data visualization, instruction set simulation and much more.

**National Instrument's Educational Laboratory Virtual Instrumentation Suite (NI ELVIS)** is a LabVIEW-based, hands-on design and prototyping environment geared for university engineering and science courses. NI ELVIS consists of LabVIEW virtual instruments, a multifunction data acquisition device and a custom-designed bench-top workstation. The combination of NI ELVIS with the MCU SLK is ideal for conducting microcontroller instruction, as they provide a powerful development and debugging platform through the integrated instrument suite of NI ELVIS.

The NI ELVIS integrated instrument suite provides essential functionality for teaching microcontrollers, including:

- > Manual and programmable power supply for powering the student project board

- > Manual and programmable signal generator and digital/analog outputs to provide stimulus to MCU input signals
- > Multiple instruments to acquire, visualize and analyze MCU output signals
- > LabVIEW integration to provide flexible design, analysis, testing and reporting

**Contacts for additional information:**

Andy Mastronardi  
Director, University Program  
Freescale Semiconductor, Inc.  
[andy.mastronardi@freescale.com](mailto:andy.mastronardi@freescale.com)

John McLellan  
Applications Engineer  
Freescale Semiconductor, Inc.  
[johnmc@freescale.com](mailto:johnmc@freescale.com)

Ravi Marawar, Ph.D.  
Academic Program Manager  
National Instruments  
[ravi.marawar@ni.com](mailto:ravi.marawar@ni.com)

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